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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/922,980	08/06/2001	Diana Xiaobing Ma	005825 USA/ETCH/DRIE	1441

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APPLIED MATERIALS, INC.
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SANTA CLARA, CA 95050

EXAMINER

ROCCHEGIANI, RENZO

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 04/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/922,980

Applicant(s)

MA ET AL.

Examiner

Renzo N. Rocchegiani

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 January 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11, 14-17, 19, 20 and 22-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 14-17, 19, 20 and 22-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claims 23, 25 and 27 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. These claims recite only apparatus limitations while they depend on process claims. Because the apparatus features are not limiting to the process, these claims are improper.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-11, 14-17, 19-20 and 22-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants admitted prior art (See figures and specification of pending application) in view of U.S. Patent No. 4,951,601 (Maydan et al.).

Applicant admits that it is well known in the art to perform a process that comprises the steps of patterning a photoresist mask material over a dielectric layer, such as an oxide layer, etching the dielectric layer using fluorocarbons and a the patterned mask down to an etch stop layer, ashing the mask layer, removing the exposed etch stop layer, depositing a barrier layer comprising tantalum in the trench,

depositing a copper seed layer wherein either one of the deposition steps are performed via sputtering. (See Fig. 1-5 in application and Background section of Specification).

Applicant points out that the prior art does not teach performing these steps using an apparatus that allows for sub-atmospheric conditions, i.e. vacuum, and wherein the wafer is transferred from one process chamber to the next without breaking the vacuum condition and without exposing the wafer to the atmosphere.

Maydan et al. teaches the use of an apparatus that would allow the transfer of a wafer from one chamber to another while maintaining vacuum conditions and thus without exposing the wafer to the atmosphere, such apparatus being adaptable to any process including but not limited to: chemical etching, vapor deposition, sputtering and heat treatment steps. (col. 2, lines 35-45). Maydan et al. also teaches connecting one or more of these apparatus together so as to combine multiple processes into a batch system. (Fig. 20, col. 11, lines 50-67 and col. 12, lines 1-12).

It would have been obvious to one having ordinary skill in the specific art to combine the teachings of Maydan et al. to the prior art teachings disclosed by applicant to arrive at the claimed invention, since it has been held to be within the level of ordinary engineering skill to convert a process from continuous to batch *In re Dilnot*, 138 USPQ 248 (CCPA 1963).

Response to Arguments

4. Applicant's arguments filed on January 15, 2003 have been fully considered but they are not persuasive. First, the examiner hereby withdraws the 112 rejections previously presented as they have been cured by the amendment filed and entered as

paper # 4. Applicant argues that the present invention is distinguishable from Maydan et al. because Maydan et al. do not teach two chambers with different base pressures or that the etch chamber is coupled with the high-pressure chamber, also applicants emphasizes that Maydan et al. do not address the problem of fluorine contamination. Furthermore, applicant argues that the newly added dependent claims that address the use of a fluorine base chemistry and the use of a double-gate between the chambers also render the present invention obvious. The examiner disagrees with applicant's arguments.

First, the examiner agrees with applicant that Maydan et al. do not specify the two transfer chambers to be a different pressures, yet looking at the claims in the present invention the examiner notices that the only limitations claimed are that the first transfer chamber is at a pressure of no more than 1 Torr and the second at a pressure of no more than 10^{-6} Torr. While these two pressures may hint that the two chambers are operated at different pressures, in giving the broadest possible interpretation the examiner finds that the claims also cover two chambers that are at the same pressure, for example both chambers could be maintained at 10^{-6} Torr or less. Thus, since Maydan et al. already teach that the chambers must be a vacuum conditions this limitation is rendered obvious.

Second, the fact that Maydan et al. does not address the same problems as those of the patent application does not mean that Maydan et al. does not render the process obvious. Maydan et al. teaches that multiple chambers are connected together through transfer chambers and that different processes, as those claimed in this

application, may be performed in the different chambers. Maydan et al. teaches that the motivation to use the apparatus is to maintain the whole process in situ. Because maintaining a process in situ results in a number of advantages that have been recognized in the art, a worker with general skill in the specific art would already be motivated to combine the teachings of Maydan et al. with what the applicant has admitted to be prior art and arrive at the process claimed in this application. Thus, the process is rendered obvious even though a different motivation is present behind the combination of the different steps.

Third, regarding the added claims with the new limitations, the examiner has modified the rejection to incorporate these new claims. As for the claims that are directed to the limitation of a fluorine base chemistry, this limitation is also found in the background disclosure of the application, wherein it is stated that fluorocarbons are used for the etching process. Thus, applicant's own disclosure as to what is already known in the prior art already covers this limitation. As for the double-gate feature of the apparatus, the examiner has not given any weight to this limitation for it is only limiting to the apparatus and not the process.

For the foregoing reasons the examiner has decided to maintain the rejections as previously presented and is thus making this action final.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renzo Rocchegiani whose telephone number is (703) 308-5839. The examiner can normally be reached on Monday through Friday from 8:30 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached at (703) 308-1323. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

RNR

March 24, 2003



MATTHEW SMITH
SUPERVISORY PATENT EXAMINER
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